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In the refining of crude oil, vacuum gas oil hydrotreaters and hydrocrackers
are used to remove impurities such as sulfur, nitrogen, and metals from the
crude oil. Typically, the middle distillate boiling material (boiling in the range
from 250°F-735°F) from VGO hydrotreating or moderate severity
hydrocrackers does not meet the smoke point, the cetane number or the
aromatic specification. In most cases, this middle distillate is separately
upgraded by a middle distillate hydrotreater or, alternatively, the middle
distillate is blended into the general fuel oil pool or used as home heating oil.
With this invention, the middle distillate is hydrotreated in the same high
pressure loop as the vacuum gas oil hydrotreating reactor or the moderate
severity hydrocracking reactor. The investment cost saving and/or utilities
saving are significant since a separate middle distillate hydrotreater is not
required. A major benefit of this invention is the potential for simultaneously
upgrading difficult cracked stocks such as Light Cycle Oil, Light Coker Gas Oil
and Visbroken Gas Oil or Straight-Run Atmospheric Gas Oils utilizing the
high-pressure environment required for mild hydrocracking.